THAT WHICH IS CLAIMED:

1. A method of forming a weld joint, the method comprising:

disposing a sealant in an interface defined by first and second faying surfaces of at least one structural member;

initiating an exothermic reaction in the sealant such that the sealant at least partially seals the interface between the faying surfaces; and

friction welding the at least one structural member to form a joint between the first and second faying surfaces, the joint being at least partially sealed by the sealant.

2. A method according to Claim 1 further comprising providing the sealant, the sealant comprising at least one of the group consisting of aluminum, nickel, and oxygen.

3. A method according to Claim 1 wherein said initiating step comprises filling substantially the entire interface with the sealant.

4. A method according to Claim 1 wherein said friction welding step comprises rotating a friction stir welding pin extending from a shoulder and urging the pin through the interface to thereby friction stir weld the at least one structural member.

5. A method according to Claim 1 wherein said friction welding step comprises urging a friction welding tool through the faying surfaces in a direction substantially perpendicular to the interface.

6. A method according to Claim 1 wherein said disposing step comprises disposing the sealant as a foil between the faying surfaces.

7. A method according to Claim 6 further comprising forming the sealant, said forming step comprising layering a plurality of laminar sheets of the sealant to form a multilayer foil.

8. A method according to Claim 1 wherein said disposing step comprises disposing the sealant as a fluid on at least one of the faying surfaces.

9. A method according to Claim 8 further comprising providing the sealant as the fluid, the fluid including a plasticizer.

10. A method according to Claim 1 further comprising providing the sealant on a substrate, and wherein said disposing step comprises disposing the sealant and the substrate onto at least one of the faying surfaces.

11. A method according to Claim 10 further comprising removing the substrate from the faying surface prior to said friction welding step such that the sealant remains on the faying surface.

12. A method according to Claim 1 wherein said initiating step comprises heating the sealant to an initiation temperature of the sealant and thereby initiating the exothermic reaction of the sealant.

13. A method according to Claim 1 wherein said initiating step is performed prior to said friction welding step such that the exothermic reaction of the sealant substantially terminates before the sealant is friction welded.

14. A method according to Claim 1 wherein said initiating step is performed concurrently with said friction welding step.

15. A method according to Claim 14 wherein said initiating step comprises heating the sealant to an initiation temperature of the sealant by friction stir welding.

16. A method according to Claim 1 wherein said initiating step is performed subsequent to said friction welding step.

17. A method according to Claim 1 further comprising providing the at least one structural member, the structural member comprising at least one of the group consisting of aluminum, aluminum alloys, titanium, titanium alloys, and steel.

18. A method according to Claim 1 further comprising disposing a braze material in the interface, the braze material having a melting temperature lower than a melting temperature of the structural member and the braze material being at least partially bonded to the faying surfaces during an exothermic reaction of the sealant.

19. A method according to Claim 18 further comprising providing the braze material, the braze material comprising at least one of the group consisting of bronze, copper, aluminum, and nickel.

20. A method according to Claim 1 wherein said initiating step comprises initiating an exothermic reaction of the sealant, the reaction having a maximum temperature of at least about 1200 °F.

21. A method according to Claim 1 wherein said disposing step comprises disposing the sealant having a thickness of between about 0.0005 and 0.020 inches.

22. A method according to Claim 1 wherein said initiating step comprises reacting at least some of the sealant outside the interface to form a fillet seal on at least one edge of the interface.

23. A method according to Claim 1 further comprising urging said faying surfaces together before said initiating step such that some of the sealant is squeezed from the interface and subsequently exothermically reacted to form a seal on at least one edge of the interface.

24. A method of forming a joint between at least one structural member, the method comprising:

disposing a sealant in an interface defined by first and second faying surfaces of the at least one structural member;

initiating an exothermic reaction in the sealant such that the sealant at least partially seals the interface between the faying surfaces; and

joining the at least one structural member to form a joint between the first and second faying surfaces, the joint being at least partially sealed by the sealant.

25. A method according to Claim 24 further comprising providing the sealant, the sealant comprising at least one of the group consisting of aluminum, nickel, and oxygen.

26. A method according to Claim 24 wherein said initiating step comprises filling substantially the entire interface with the sealant.

27. A method according to Claim 24 wherein said joining step comprises welding the structural members at the interface for form a weld joint between the structural members.

28. A method according to Claim 27 wherein said welding step comprises at least one of the group consisting of arc welding and laser welding.

29. A method according to Claim 27 wherein said initiating step comprises heating the sealant to an initiation temperature of the sealant by said welding step.

30. A method according to Claim 24 wherein said joining step comprises disposing at least one connector through the interface to join the structural members.

31. A method according to Claim 24 wherein said disposing step comprises disposing the sealant as a foil between the faying surfaces.

32. A method according to Claim 31 further comprising forming the sealant, said forming step comprising layering a plurality of laminar sheets of the sealant to form a multilayer foil.

33. A method according to Claim 24 wherein said disposing step comprises disposing the sealant as a fluid on at least one of the faying surfaces.

34. A method according to Claim 33 further comprising providing the sealant as the fluid, the fluid including a plasticizer.

35. A method according to Claim 24 further comprising providing the sealant on a substrate, and wherein said disposing step comprises disposing the sealant and the substrate onto at least one of the faying surfaces.

36. A method according to Claim 35 further comprising removing the substrate from the faying surface prior to said joining step such that the sealant remains on the faying surface.

37. A method according to Claim 24 wherein said initiating step comprises heating the sealant to an initiation temperature of the sealant and thereby initiating the exothermic reaction of the sealant.

38. A method according to Claim 24 wherein said initiating step is performed prior to said joining step.

39. A method according to Claim 24 wherein said initiating step is performed subsequent to said joining step.

40. A method according to Claim 24 further comprising providing the at least one structural member, the structural member comprising at least one of the group consisting of aluminum, aluminum alloys, titanium, titanium alloys, and steel.

41. A method according to Claim 24 further comprising disposing a braze material in the interface, the braze material having a melting temperature lower than a melting temperature of the structural member and the braze material being at least partially bonded to the faying surfaces during an exothermic reaction of the sealant.

42. A method according to Claim 41 further comprising providing the braze material, the braze material comprising at least one of the group consisting of bronze, copper, aluminum, and nickel.

43. A method according to Claim 24 wherein said initiating step comprises initiating an exothermic reaction of the sealant, the reaction having a maximum temperature of at least about 1200 °F.

44. A method according to Claim 24 wherein said disposing step comprises disposing the sealant having a thickness of between about 0.0005 and 0.020 inches.

45. A method according to Claim 24 wherein said initiating step comprises reacting at least some of the sealant outside the interface to form a fillet seal on at least one edge of the interface.

46. A method according to Claim 24 further comprising urging said faying surfaces together before said initiating step such that some of the sealant is squeezed from the interface and subsequently exothermically reacted to form a seal on at least one edge of the interface.

47. A weld joint connecting first and second faying surfaces of at least one structural member defining an interface therebetween, the weld joint comprising:

a friction weld joint connecting the faying surfaces at the interface of the faying surfaces; and

an exothermically reacted sealant disposed in the interface between the faying surfaces and at least partially sealing the friction weld joint in the interface.

48. A joint according to Claim 47 wherein the sealant comprises a product of at least one of the group consisting of aluminum, nickel, and oxygen.

49. A joint according to Claim 47 wherein the sealant substantially fills the interface.

50. A joint according to Claim 47 wherein the sealant seals the faying surfaces outside the interface.

51. A joint according to Claim 47 wherein the friction weld joint comprises a nugget area formed by friction stir welding and characterized by a refined granular structure.

52. A joint according to Claim 47 wherein the friction weld joint extends through the at least one structural member in a direction substantially perpendicular to the interface.

53. A joint according to Claim 47 wherein the at least one structural member is formed of at least one of the group consisting of aluminum, aluminum alloys, titanium, titanium alloys, and steel.

54. A joint according to Claim 47 further comprising a braze joint between the faying surfaces proximate to the friction weld joint, the braze joint at least partially sealing the interface.

55. A joint according to Claim 54 wherein the braze joint is formed of at least one of the group consisting of bronze, copper, aluminum, and nickel.

56. A joint connecting first and second faying surfaces of at least one structural member defining an interface therebetween, the joint comprising:

a connection extending between the faying surfaces of the at least one structural member at the interface of the faying surfaces and connecting the faying surfaces; and

an exothermically reacted sealant disposed in the interface between the faying surfaces and at least partially sealing the connection in the interface.

57. A joint according to Claim 56 wherein the sealant comprises a product of at least one of the group consisting of aluminum, nickel, and oxygen.

58. A joint according to Claim 56 wherein the sealant substantially fills the interface.

59. A joint according to Claim 56 wherein the sealant seals the faying surfaces outside the interface.

60. A joint according to Claim 56 wherein the connection comprises a weld joint formed by at least one of the group consisting of laser welding and arc welding.

61. A joint according to Claim 56 wherein the connection comprises at least one connector extending between the at least one structural member, each connector comprising at least one of the group consisting of bolts and rivets.

62. A joint according to Claim 56 wherein the at least one structural member is formed of at least one of the group consisting of aluminum, aluminum alloys, titanium, titanium alloys, and steel.

63. A joint according to Claim 56 wherein the at least one structural member comprises at least one non-metallic structural member.

64. A joint according to Claim 56 further comprising a braze joint between the faying surfaces proximate to the friction weld joint, the braze joint at least partially sealing the interface.

65. A joint according to Claim 64 wherein the braze joint is formed of at least one of the group consisting of bronze, copper, aluminum, and nickel.